

[0001] The present invention relates to the area of the collection and preservation of biological specimens.

[0002] The present invention relates more particularly to a sleeve apparatus that allows cryotubes to be secured that can contain, e.g., blood samples or tissue samples.

[0003] A cryotube is a cylindrical plastic container classically composed of two elemental pieces: the tube and the plug. The tightness of the assembly of these two pieces (generally by screwing) permits the preservation of specimens inside the cryotube at variable temperatures that can drop according to the models down to -196°C (liquid nitrogen), whence the term “cryo” tube.

[0004] The prior art already knows tubes that can contain specimens to be frozen under liquid nitrogen.

[0005] The present invention adds a third piece to the tube-plug couple: a securement sleeve. This piece will be called “sleeve” in the following.

[0006] The securement of the tubes for the collecting and preserving of specimens includes the following elements:

- Guarantee of the physical integrity of the specimen once the tube is closed (rendering the specimen inviolable at a high level of security, definitive and non-replaceable indicator of violation integral with the container and not with the plug;
- Guarantee of the integrity of the empty tube: good closure, of the sterility and of the emptiness of the interior of the cryotube before use;

- Guarantee of the unique and inalterable identification of the tube and therefore of the specimen that it contains (non-identified specimen = lost specimen);
- Guarantee of the anonymity of the specimen.

[0007] The cryotubes corresponding to the prior art do not respond or respond in a very incomplete or partial manner to the totality of these security requirements.

[0008] The securing of cryotubes is becoming more and more important given the increasingly central part played by analysis in the area of forensic medicine for example. DNA analyses for example, are used instead of evidence in more and more cases. The use of secure containers (sampling, traceability and preservation) is therefore now required if the user (the justice system in this instance) desires to have specimens that are physically and legally reliable.

[0009] The invention therefore has the problem of making available the maximum degree of security corresponding to the guarantee levels described above.

[0010] In order to accomplish this, the present invention is of the type described above and is remarkable in its broadest meaning in that it relates to an apparatus for securing a container for collecting and preserving biological specimens and comprising a plug, characterized in that it comprises at least one means such that after the interlocking of this apparatus any access to the contents of this apparatus necessarily brings about a physical transformation, that is irreversible and can be ascertained by the naked eye, of this container (and not of the plug), which physical transformation consists, e.g., but not necessarily, of a rupture or a tear of this means.

[0011] This security device can preferably be interlocked at any moment at the will of the user.

[0012] This means is advantageously integral with this apparatus.

[0013] This means is preferably a divisible clamp [lug, flap].

- [0014] This apparatus can not be disassociated from the container.
- [0015] The interlocking of this apparatus is advantageously made by irreversibly driving the container into this apparatus.
- [0016] This apparatus and this container are preferably made of different materials.
- [0017] This apparatus is advantageously composed of a material that allows the engraving of an indelible and unitary identification.
- [0018] According to a variant this apparatus is composed of a material that allows the reading of the elevated contrast engraving.
- [0019] According to an embodiment the means is a tongue that can be integrated in a definitive and non-replaceable manner with the apparatus and the plug.
- [0020] According to an embodiment this integration of the tongue is carried out with an adhesive band that can not be violated by tearing.
- [0021] According to another embodiment this integration of the tongue is carried out by a welding.
- [0022] This apparatus also advantageously comprises a housing that allows the insertion of a physical element containing at least one piece of information associated with the contents.
- [0023] This insertion is preferably carried out without masking this identification engraving and in an irreversible manner.
- [0024] This insertion is preferably carried out in an irreversible manner.
- [0025] The invention will be better understood with the aid of the description, given in the following solely by way of explanation, of an embodiment of the invention with reference made to the attached figures in which:

Figure 1 shows a view of the tube for containing specimens.

Figures 2 and 3 show the securement sleeve with or without the plug in accordance with the invention.

Figure 4 shows the plug associated with the securement sleeve provided with the security tongue in accordance with the invention.

Figure 5 shows the plug associated with the securement sleeve provided with the security tongue in accordance with the invention in closed position.

Figure 6 shows the interlocking of the tube in the sleeve according to a first catch [notch].

Figure 7 shows the interlocking of the tube in the sleeve according to a second catch.

Figure 8 shows the sleeve after breaking of the divisible security clamp.

Figure 9 shows the sleeve after the placing of the security tongue.

[0026] In figure 1 tube 1 suitable for receiving specimens is a cold-resistant container of polypropylene (PP). It is provided with outer screw thread 2 and a system of definitive interlocking at two levels of the sleeve (one-way assembly).

[0027] The first catch 3 is an assembly catch serving to integrate the sleeve to the tube in a definitive manner (one way).

[0028] The second catch 4 is an interlocking catch of the apparatus for rendering the tube inviolable by divisible clamps with the sleeve. This first degree of security will be called “first-degree securement” or “first-degree inviolability”.

[0029] Any collars 5 of the tube have undercuts [incisions] 6 necessary for the passage of the various inviolability apparatuses in interlocked position.

[0030] In figures 2, 3 sleeve 7 is constituted by any rigid material, e.g., polyamide (PA). It should be noted that it is not in contact with the specimens. The specifications of the tubes and of the sleeves are very different and at times divergent.

[0031] This allows the free addition, directly on the sleeve, of any marking or securement additive. Thus, if the markings by labels in the liquid are not satisfactory, it is possible to mark the sleeve with a laser for an inalterable authentication.

[0032] It is preferably more practical for the manipulations to see the specimen or its level. A volume mark or other mark 8 is then engraved in the mold directly on the sleeve. This system allows expensive marking steps to be avoided.

[0033] The sleeve has, e.g., label zones or laser-marking zones.

[0034] The sleeve bottom is flat and smooth in order to be able to be engraved on the lower part of the sleeve.

[0035] Moreover, the sleeve is provided with hook system 9 for an automatic screwing.

[0036] Furthermore, it has a lateral drawer for collecting a physical element carrying information relative to the specimen, e.g., a radio frequency chip (RFID). It is on the side in order not to hide the marking zones under the sleeve.

[0037] It also comprises an essential security element in the form of an element whose rupture is irreversible, representing the first degree of securement.

[0038] This element is preferably a divisible clamp 11 integral with the sleeve. The characteristics of the clamp are such that it breaks when the plug is opened if the securement system is interlocked, as illustrated in figure 8.

[0039] Furthermore, the sleeve contains a zone 12 suitable for receiving and retaining in vertical position without excessive thickness [with a flush contour] any tongue integrated conjointly with the sleeve and the plug.

[0040] This tongue can be integrated with the sleeve by various means such as, e.g., by welding or by an inviolable adhesive band of a known type.

[0041] As is shown in figure 4, the plug is a covering screw plug provided with a flexible joint in order to ensure the tightness in the liquid nitrogen or in the nitrogen vapor.

[0042] It is provided with an automatic screwing apparatus by upper latching and with an apparatus allowing, e.g., the clipping of a color code in the form of a circular disk.

[0043] According to a particular embodiment shown in figure 4 the apparatus can receive support tongue 13 by clipping, that represents the second degree of the security level.

[0044] Moreover, the plug has passage undercut 14 for permitting the passage without excess thickness of the tongue in closed position as in figure 5.

[0045] Furthermore, according to an embodiment the plug comprises an internal clipping part in its interior suitable for receiving accessories for the manipulation of the specimens directly in the interior of the tube in order, e.g., to facilitate the extraction of specimens and their use.

[0046] Finally, it also comprises on its lower part housing 15 for receiving first-degree divisible securement clamp 11 in interlocked position.

[0047] The unit "tube-sleeve-plug-" is used for purposes of the securement and manipulation of specimens. The methods of use can then be a function of the level of security required.

[0048] According to first method of use in the case of a standard laboratory the plug is screwed on the tube and the sleeve interlocked on first catch 3 as in figure 6. The user can then

unscrew the plug, place the specimen inside the tube, screw the plug back on and engage the first degree of inviolability himself by interlocking second catch 4 as in figure 7.

[0049] It can be noted that in this method of use the sterility level of the tube is guaranteed by the supplier of the tube. On the contrary, after the interlocking on the second catch, any opening of the tube will bring about the breaking of divisible clamp 11 and will be noticed, as in figure 8.

[0050] According to a second method of use of the invention in the case of tubes for use in forensic medicine the user receives the plug apparatus closed with second catch 4 interlocked as in figure 7, which guarantees the emptiness and a sterility level before any usage in the instance in which divisible clamp 11 is intact.

[0051] After use and the introduction of the specimens into the tube the inviolability is ensured by the second-level security apparatus with the aid of tongue 13 integrated conjointly with the sleeve and the plug as in figure 9.

[0052] The invention was described above by way of example. It is understood that an expert in the art is capable of realizing different variants of the invention without departing from the scope of the patent.